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ABSTRACT

This paper provides information about the design of a mathematics education degree program. One focus of this program is to increase the mathematical knowledge of teachers. Other focuses of the program include current issues in mathematics education and the development of teacher-leaders. Additional discussions about leadership development in mathematics education and benefits for faculty are also provided. (ASK)

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ED 452 041

Developing Teacher-Leaders in a Master's Degree Program in Mathematics Education[1]

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I am a mathematics educator in the Department of Elementary Education at San Francisco State University. Since the 1970s I have been personal friends and colleagues with mathematics educators in the Mathematics Department. Over the years we have worked together in a variety of ways including professional development grants for elementary and middle school teachers and serving in professional organizations. We have been an important means of collegial support for each other. It was no accident, then, in 1993, when we received a Request for Proposals (RFP) from the Dwight D. Eisenhower Mathematics and Science Education State Grant Program to develop a master's degree program in mathematics education for minority teachers that we were ready and willing to take on this task.

Jose Gutierrez, a professor in the Mathematics Department, and I welcomed this opportunity to write a planning grant for this purpose. Jose has spent most of his career teaching mathematics education courses for undergraduates planning to become elementary teachers. For several years, we had been discussing the possibilities for a joint masters degree program, but it was the RFP that gave us the impetus to move forward.

We had been working with K-8 classroom teachers through the San Francisco Math Leadership Project (one of the California Mathematics Projects since 1984 and knew of the plight of our teachers: they had become interested in mathematics education; they realized that they really could learn and understand mathematics, and, indeed problem solve. Overall, they had a renewed interest and enthusiasm about mathematics learning and teaching. Unfortunately, there was no place for them to go

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to continue studying in this area. These teachers need to be in an environment where they can work with others, feel free to make mistakes and learn from them; and they need challenging content, which, at the same time, is related to school mathematics. Typically, mathematics departments don't offer the kinds of courses that would be appropriate for these teachers. Another problem is that few courses are offered at hours that classroom teachers can fit into their busy schedules.

Planning and Beginning the Degree Program

We wanted to design a mathematics education degree program would validate the efforts of teachers to improve the mathematics programs in their classrooms and in their schools, and would also give the teachers official recognition of their work in this field. It would encourage them to continue in their studies and add a depth to their knowledge in both the content and the pedagogical issues of the current mathematics reform movement. And so this degree was developed between the Department of Elementary Education and the Mathematics Department with courses from both departments. We utilized some existing courses and designed a few new courses, in particular: *Analyzing Cases of Math Teaching (Ed), Developing Leadership in Mathematics Education (Ed), Assessing Mathematical Thinking (Ed), and Mathematical Investigations: Dissection and Integration of Topics (Math).* Requirements for the degree would include four courses from the Mathematics Department, four Elementary Education courses, a course in *Research Methods in Education*, and writing a thesis or conducting a field study.

Following the planning grant, we received the full grant to implement this two and one-half year program. As the grant included stipends for teachers, we expected that the recruitment process would be successful. However, we were not prepared for the many, many teachers who attended our information meeting about the program,

and had to quickly change the room to an auditorium to hold the more than 160 teachers who attended. We received 80 completed applications for our first cohort, and selected an ethnically diverse group of 30 students. Going through the sequence of courses as a learning community, the teachers provided an enormous amount of support for one another. The first cohort graduated in May, 1997; the second cohort graduated in May, 2000.

Mathematics, Current Educational Issues, and Developing Teacher-Leaders

One focus of this program is to increase the mathematical knowledge of the teachers. There are four courses in the Mathematics Department: *Geometry, Measurement and Probability; Curriculum and Instruction in Mathematics; Computers and Elementary Mathematics* , and *Mathematical Investigations*. Completing these courses gave the teachers the opportunity to apply for a supplementary authorization in mathematics for middle school teaching.

Another focus of the program is current issues in mathematics education. With the many changes occurring in mathematics education, these teachers need to be on the cutting edge of the current reform movement.

The third focus of the program, development of teacher-leaders, is the most unusual aspect of the program. We need more teacher-leaders, and we need more teacher-leaders of color. We've learned that leadership can take a great variety of forms. Presenting workshops at the school, district, state, and national level is one type of leadership. Writing articles and developing curriculum materials is another type of leadership. Planning conferences for teachers and teachers-to-be, taking leadership positions in math organizations, state councils, and statewide committees, and working with pre-service teachers are additional examples of roles that our graduates have taken. Through this program, teachers have the opportunity to strengthen their

leadership skills in these areas and are encouraged and supported in developing strengths in new areas.

Leadership Development in Mathematics Education

Although the entire program contributes to developing leadership, the course *Leadership Development in Mathematics Education* was designed specifically for the program to focus on leadership issues. It is offered early in the program so that from the beginning the teachers see developing leadership skills as an expectation of the program. The course focuses on three topics: examination of major issues in mathematics education; review and analysis of major documents of the reform movement in mathematics education; and examination of leadership and dissemination practices.

We first focused on issues in mathematics education. Class discussions were built around articles from National Council of Teachers of Mathematics (NCTM) Yearbooks on *Multicultural and Gender Equity in the Mathematics Classroom* (1997) and *Teaching and Learning Mathematics in the 90s* (1990). The teachers then selected issues to pursue in greater depth and were expected to present different perspectives of the issue to the class. The teachers also wrote individual papers on a second issue of their choice.

Although the teachers were familiar with some of the major documents of the reform movement, and even had copies of some documents, they had not really looked at them in depth. Some time was spent examining more closely the *1992 California Mathematics Framework*, NCTM's *Curriculum and Evaluation Standards for School Mathematics* (1989), NCTM's *Professional Standards for Teaching Mathematics* (1991), and *Everybody Counts - A Report to the Nation on the Future of Mathematics Education* (National Research Council, 1989).

We also spent considerable time practicing leadership. Selected articles from the NCTM 1994 Yearbook on *Professional Development for Teachers of Mathematics* were assigned as useful background reading: "Changing Mathematics Teaching Means Changing Ourselves: Implications for Professional Development," by Julian Weissglass and "Ten Key Principles from Research for the Professional Development of Mathematics Teachers," by Doug Clarke. One of the class activities was to develop and get feedback on a workshop to be presented at the teachers' schools. Some students had never before presented a workshop and the support of the group was invaluable. In addition, the grant provided funds for all the teachers to attend the California Math Council's Annual Conference as well as the annual conference of NCTM. We hoped they could envision themselves presenting at these conferences in the future.

Real Life Math Education Activities and Final Project

There was a great deal of mathematics education activity taking place in California during the Fall of 1997, the very semester that the leadership course was taught. The students had an opportunity to hear William Schmidt, Executive Director of the Third International Math and Science Study (TIMSS), talk about the TIMSS results. They also had a chance to attend hearings on the new math standards being developed by the State of California. In fact, a few teachers actually testified at these hearings. For one class assignment the teachers were to submit responses to the draft of the new *Math Framework for California Schools*, which was being developed during the same semester. These real life opportunities for leadership contributed greatly to the teachers' development as teacher-leaders.

The final project, either a field study or thesis, plays an important role in the development of teacher leadership. Several teachers from the first cohort have had opportunities to present their work at local and national conferences. The issues chosen

for study by the teachers represent real world questions that have emerged for them in the course of the program, but also reflect their concerns as full-time teachers. A sampling of titles illustrates the variety of topics: *A Second Grade Spanish Curriculum Unit for Developing Mathematical Language; Ethnicity as a Factor in Assigning Mathematical Competence to Elementary Level Students; Teaching Students to Write About Mathematical Problems; Observation and Analysis of 4th Grade Latino Students' Problem Solving Behaviors Using a videotape Protocol; The Development, Implementation and Evaluation of Family Volunteer Workshops that Promote Math Literacy in Young Children; Using Hyperstudio as an Assessment Tool; A Survey of Teachers' Beliefs About Pre-Requisite Experiences For Student Success in Algebra.*

Benefits for Faculty

Having a grant allowed us to recruit faculty from outside the university, as well as enlist faculty from several departments. There are a total of nine instructors, including five university professors and four faculty from outside the university, two of whom are from the San Francisco Unified School District. A faculty member teaches courses, works with the teachers on their final projects, or both. The nine faculty members serve on the project Advisory Board as well as attend regular meetings to discuss the program and the progress of the students.

Two weekend retreats helped develop the collegiality among faculty and teachers. The first retreat, held at the start of the program, is an opportunity (1) for participants to get to know each other, (2) to prepare the teachers for the program, and (3) to give introductory sessions to the courses for the following semester. At the second retreat, held at the beginning of the intense work period for the final project, teachers write, meet with faculty, and have an opportunity to develop and expand their ideas with a variety of people.

During the Fall 1998 semester we tried something new-- three all-day Saturday meetings for the teachers and faculty as a kick-off to the research methods course to be taught in the spring. Teachers presented their beginning ideas for their final projects and the faculty made suggestions and elaborated on the teachers' ideas. The faculty also benefited greatly from this exchange. One of these Saturday meetings was devoted to a discussion of qualitative research methods. The discussion, based on the transcript of an earlier teacher discussion about a case study, allowed the teachers to study themselves as subjects. The interest level was extremely high and both teachers and faculty learned a great deal about the challenges of doing careful qualitative research.

Undertakings such as designing and running a new program often yields unexpected outcomes. The benefit to the faculty in this project is one of those pleasant surprises.

FOOTNOTE

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